Advanced Training Technologies And Their Impact On Human Performance Improvement

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Summary

This NATO symposium is focused on advanced training technologies that can have a significant impact on the way NATO member nations prepare their personnel for peace and wartime duties. There have been some remarkable developments in our ability to better train personnel. However, merely improving training is not enough to assure that our military organizations are optimized for their duties. We must help our militaries to become "learning organizations" that wisely make use of a variety of technologies, including training, as we seek to optimize human performance improvement. Conceptual underpinnings that are requisite to forming learning organizations are examined. Strategic planning tools, knowledge management systems, and the Learning Management Maturity Model are among the topics explored. Those who seek to transform our militaries into learning organizations should view training and training technologies as two important arrows in the entire quiver of human performance improvement technology.

Introduction

Training is a critical part of NATO military preparedness. NATO militaries expend millions of hours in training each year, and some would say that virtually all non-wartime military activity could be called training. NATO military training spending easily exceeds a hundred billion U.S. dollars each year. In this advanced training technology symposium significant new advances are discussed in training technologies and methods. These advances will help to dramatically improve our capability to train individuals and teams to new levels of competence in a variety of warfare and peacekeeping domains. The papers in the symposium span a wide gamut of training topics including;

- infantry training
- peacekeeping training
- airmanship and aircrew training
- command and control training
- security training
- sonar training
- civil emergency training

Modeling and simulation, instructional and cognitive psychology, and educational technology are just a few of the tools that are being used to address the training domains. All of the papers provide a useful set of snapshots of the state of the art in training development.

This paper posits that no matter how effective we make our training technologies and techniques, we will ultimately fall short of our goal of optimal military performance if training is the only

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tool that we use. Training, as important as it is, should be viewed as only one arrow in our quiver of arrows that can be used to improve human performance in our militaries. I believe it can be shortsighted to assume that because we can perfect our training approach that we should assume that we are doing all we can to optimize the performance of our military personnel. I believe the time has come to move into a new era of human performance technology as we seek to make our militaries the "learning organizations" that they should become. I view training as a tactical tool, that when used appropriately with other tactical tools for performance improvement can help us to reach optimum performance in our militaries. To do that, we must view the performance improvement enterprise from an organizational strategic level.

The business community has been facing this issue for years. Try as they might, as spend as much as they could, our colleagues in the business community have gradually come to the conclusion that merely providing more and better training will not by itself produce the performance gains that businesses need to stay competitive. In many cases training had become an end in itself and was frequently not well tied to the overall strategic thrust and vectors that businesses were pursuing. Training departments in business were finding themselves on the outside looking in as businesses pursued new directions with which traditional training departments were ill suited to cope. The end result was that training departments were finding themselves marginalized as they had difficulty providing satisfactory answers to "Return on Investment" questions that senior business leaders were asking about the training enterprise.

O'Driscoll (2003) stated well the conundrum that training managers face:

"Today the training function finds itself at a crossroads. The unwillingness of training directors to let go of the bureaucratic machine they have created for themselves has become an issue that could call into question the value of training. In continuing to focus on measures that do not correlate well to organizational performance, training directors might in fact be compromising the future of their own functions." p. 8

Human Performance Technology

As our NATO militaries actively take on the quest of transforming themselves to meet the challenges of the post-cold war era, and the increase in international terrorism, it is vital that the role of human performance improvement be re-examined. Key questions for the training and training research community should be, "Will excellent training by itself be enough to produce the competencies required?" and "How can we help our militaries take a more strategic view of human performance improvement, of which training is an important tactical tool?"

I believe that Human Performance Technology (HPT), of which training is a piece, is the answer to the performance challenges our militaries face. What are these HPT technologies? Here is a partial list. They include both instructional and non-instructional interventions.

Examples of Performance Interventions of an Instructional Nature

- Classroom Instruction
- Small-Group Activities
- Video-Based Instruction
- Computer-Mediated Instruction
- Printed Self-Instruction
- Resource Management Systems

- Structured On-the-Job Training
- Distance Education Systems
- Accelerated Learning Systems

Examples of Human Performance Interventions of a Non-instructional Nature

- Organization Design (changes in the basics of an organization's processes – strategy, structure, systems, competence, and culture)
- Culture Change (response tendencies or behavior patterns that characterize people within an organization)
- Strategic Alignment (crucial organizational systems behind a common purpose or mission statement)
- Personnel Selection
- Motivational Systems (set of tactics and strategies designed to stimulate and sustain appropriate levels of goal-directed effort and affect.)
- Feedback Systems (information required for competent performance can be improved: through data manipulation, to effectively improve performance; and through improvement in the ways in which performance is directed or guided.)
- Incentive Systems (all rewards and remuneration given to an employee to elicit, improve, and maintain work performance.)
- Minimalist Documentation (reducing the obstacles to self-directed discovery and achievement that can inhere in modern systems and documentation.)
- Ergonomic Performance Aids
- Expert Systems
- Off-line resources (knowledge management)

The training community is of course quite familiar with all of the instructional interventions. The papers presented at the Symposium address all of the instructional interventions I have described, plus a variety of others. Decades of experience with these interventions have allowed dramatic increases in military performance because of better training.

Most of us in the training community are also familiar with at least most of the non-instructional interventions. These interventions come to us from a variety of disciplines (e.g., management science, industrial/organizational psychology, organizational development, human factors). For a more complete discussion on these non-instructional interventions please refer to the "Handbook of Human Performance Technology" (Eds. Stolovich and Keeps, 1999).

Rosenberg (2003), in Figure 1, graphically portrays the relationship of training and non-training interventions within the HPT tool set.

Figure 1: Relationship of training and non-training interventions (used with permission)

Learning Organizations

To create learning organizations in our militaries we must move from thinking of performance improvement as something that comes primarily from formal training, to viewing learning as a strategic approach that is a vital part of all a military does. Rosenberg (1996) describes a set of five transitions requisite to establishing a learning organization.

From	**To**
Learning as an end in itself	Valued performance as the primary measure of effectiveness
Training interventions as tactical responses to somewhat larger tactical problems	Performance technology as a strategic response to strategic needs relating to people and productivity

A view of training as overhead and support, susceptible to budget cutting and downsizing	Performance technology as a competitive resource, perhaps even more important during business downturns
Interventions placed in Human Resource functional chimneys that do not integrate with one another	An integrated performance improvement system that is systemic throughout the organization
A focus on educational results, for example, learning	A focus on organizational learning and business results

Brethower (2003) describes the goals of both Instructional Systems Development (training) and Human Performance Technology. As you will see below, he indicates that training has an essential role to play in improving human performance. However, when you compare the goals of ISD (training) to the goals of HPT it is apparent that HPT has a broader strategic reach. This broader reach is what is required to evolve an organization into a Learning Organization.

"Instructional Systems Development, used competently, assures that training delivers:

- the right knowledge
- to the right people
- at the right time
- to help improve workplace performance
- related to a significant performance issue

HPT, used competently, adds value by improving significant performance at the individual, process, and organizational level.

HPT, used wisely, adds value to an entire value chain: the organization and its customers, suppliers, employees, and financial supporters, as well as the physical, social and cultural environment." p. 12

Learning Technology Landscape

Addison's (2003) depiction of a "Learning Technology Landscape" (Figure 2) helps to put HPT into a broad context, starting with the society in which the organization exists and working down to the individual and team level. NATO militaries are part of the societies of their respective countries. The Learning Technology Landscape helps military trainers and researchers view the broader context of their efforts as they attempt to improve the performance of their militaries. It frames the key environmental levels, principals, and phases of HPT according to the systems approach to problem solving. As one examines the landscape cube, one can see that training may be useful in many of the cells of the cube. The overall organizational effectiveness of the training can be better understood by determining which of the cells training impacts. However, there will invariably be cells of the landscape in which training may not alone be effective for meeting the goals and purposes of the cell. In those cases, the HPT analyst should examine non-instructional interventions that can be used either in conjunction with a training intervention, or by themselves.

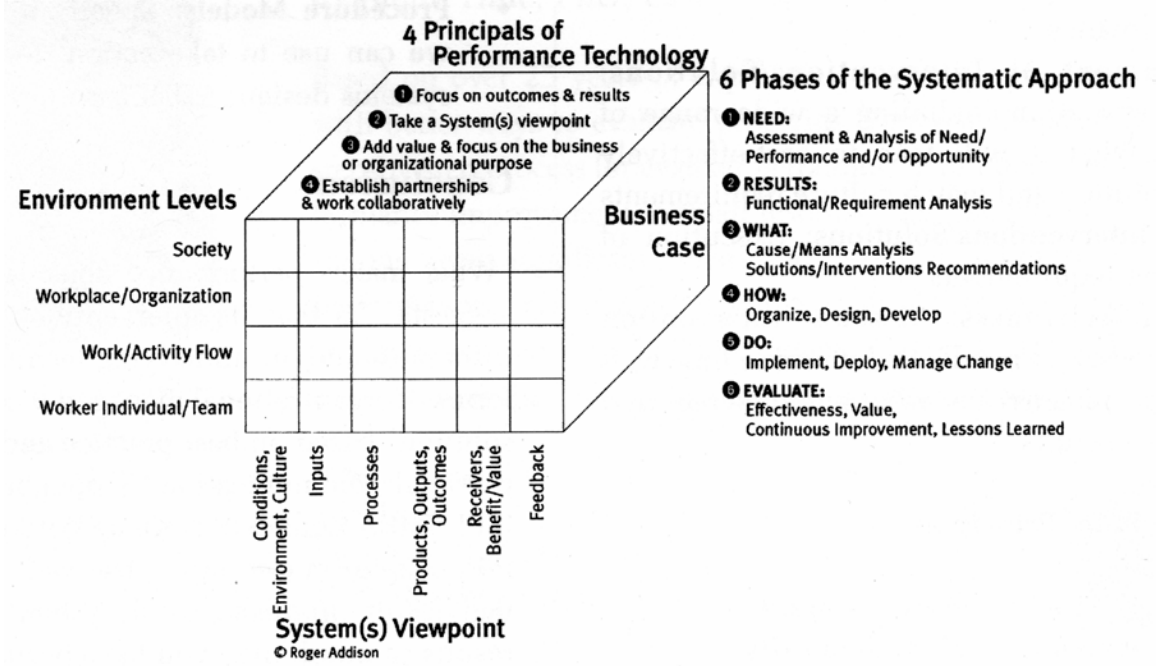

Figure 2: Learning Technology Landscape (Addison, 2003)

Addison explains that HPT methods and applications contribute to accomplishing one or more of the following:

> "- Identification of Value: Clarification of the problem, organizational issue, or opportunity
> - Definition of Outcomes: Specification of the requirements to create the value or close the gap between existing and desired results.
> - Analysis of Performance: Identification of the factors in the performance system that can influence the production of outcomes to meet requirements.
> - Selection of Interventions/Solutions: Choosing from a range of possible HPT applications those that will best meet the requirements, given the information about outcomes and performance
> - Design/Development of Interventions/Solutions: Preparation for execution including a wide range of decisions about what it will take to cost-effectively implement the solution and match culture requirements.
> - Deployment of Interventions/Solutions: Execution of the design to meet requirements
> - Evaluation of Effectiveness: Measure intervention processes, outcomes, and results to determine how well they meet the requirements and what might be required to further improve results." (Addison, 2003, P. 14)

Knowledge Management

The last few years have seen dramatic growth in tools and databases that allow individuals and teams to dramatically access to vast stores of knowledge which would have previously taken years of research to find. The internet is the most significant, although not the only example. Rosenberg (2001) tells us that, "Knowledge management supports the creation, archiving, and sharing of valued information, expertise, and insight within and across communities of people

and organizations with similar interests and needs." (p. 66). He tells us that far more than simply being a set of tools to manage information, knowledge management is about using knowledge to fulfill strategic organizational goals. He presents three levels of knowledge management.

Knowledge Management Level 1: Document management:
- access and retrieval,
- documents stored online

Knowledge Management Level 2: Information creation, sharing and management:
- capturing and distributing expert stories
- real-time information management
- communication and collaboration
- new content creation

Knowledge Management Level 3: Enterprise Intelligence
- leveraging organizational "know-how"
- performance support
- interacting with operational databases
- building expert networks

In addition to providing better training methods and technologies, we in the research community should be helping our militaries move toward Level 3 if we hope to have our militaries become true learning organizations.

This ability to systematically manage knowledge is becoming a key HPT tool. Rosenberg (2001) in Figure 3 presents a informative depiction of how the related constructs of "training", "knowledge management" and "performance support" can interact to form a strong HPT toolset. All three constructs are crucial in building a learning organization.

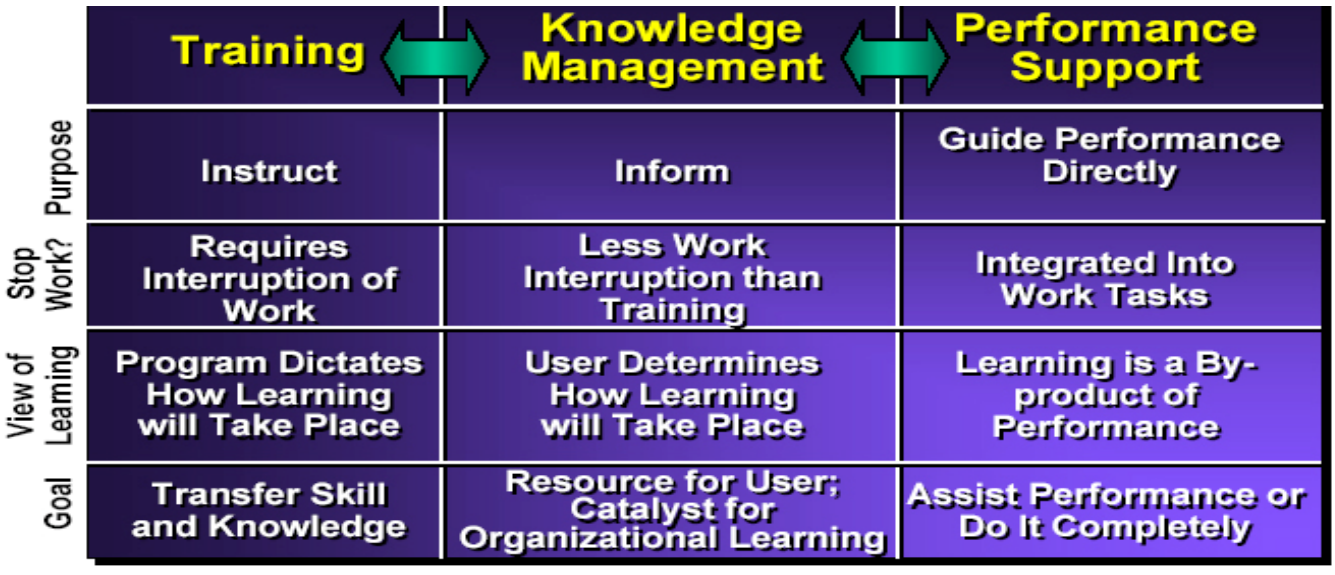

Figure 3: Relationships among training, knowledge management, and performance support HPT tools (used with permission)

Learning Management Maturity Model

Moore (2002) has developed a learning management maturity model that gives us a vision of what is required for an organization to truly become a learning organization. He indicates that there are five components of the learning management model.

- Focus on Strategic Impact of Learning
- Cultivate a Continuous Learning Culture
- Leverage Multiple Learning Channels
- Create Compelling Content
- Show the Value Back to the Organization

Figure 4 shows the stages of the model:

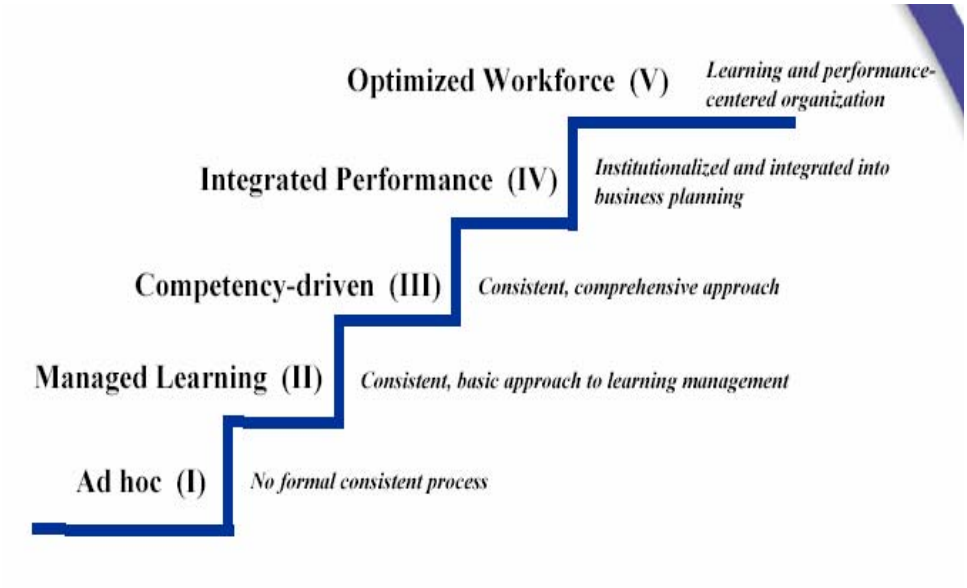

Figure 4: The Learning Management Maturity Model (used with permission)

Figure 5 depicts the nine key technologies and related pieces of the model.

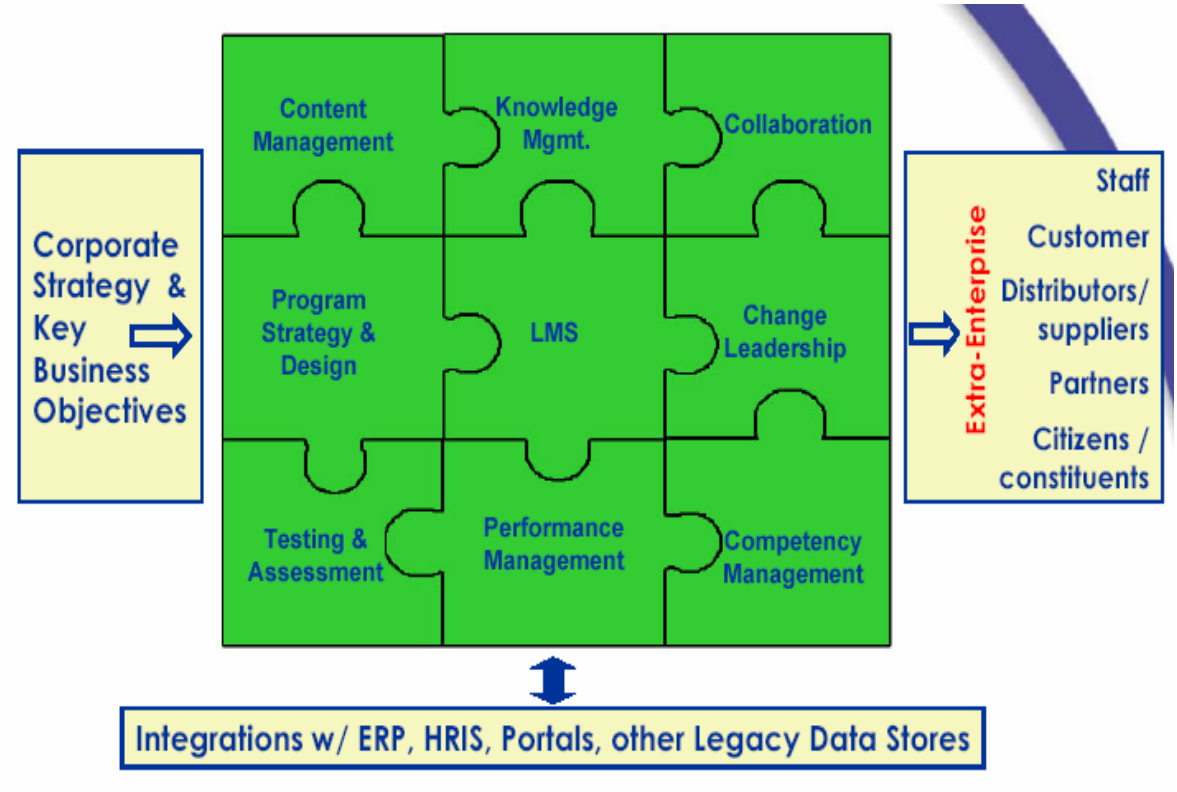

Figure 5: Nine Key Technologies and Related Pieces of the Learning Management Maturity Model (used with permission)

Content Management

- Authoring Tools
- Commercial Off-the-Shelf Providers
- Third party developers
- Learning Content Management Systems and Content Management Systems and Decision Management Systems

Testing and Assessment

- Kirkpatrick evaluations
- Pre- and Post- Testing
- 360 degree feedback

Knowledge Management

- Repository management
- Workflows

- Electronic performance support systems
- Advanced search and navigation

Learning Management Systems
- Catalog administration
- Event scheduling
- Compliance management
- Job development
- Resource management
- Skills and competency enablement

Performance Management
- Goal management
- Performance evaluations
- Talent management and Succession planning

Collaborators
- Virtual classrooms
- Blended learning
- Mentoring
- Discussions
- Online Meetings

Competency Management
- Skills libraries
- Competency maps
- Services
- Enablement tools
- Development planning

Moore indicates that the organization must have all nine pieces working synergistically together in order to reach the fifth stage of the model, the optimized workforce. He goes on to say that in his experience of consulting with numerous for-profit and government organizations he has never seen any organization get beyond stage three, competency driven. In fact seldom does he find organizations beyond even stage two, managed learning. That is, he sees the rudiments of a consistent, basic approach to learning management, but that approach is not comprehensive across the organization.

Moore is careful to point out that reaching stage four or five in the learning management model might well be a goal for many organizations, but should probably not be a goal for all organizations. It takes a considerable investment in commitment, resources and time to reach stage four or five. While the end result will be a more effective and efficient organization, the organization's leaders must be totally committed to the investments that must be made. Otherwise the organization and people will be frustrated by less than the full commitment.

How Training Technologies Can Help in Improving Human Performance

As mentioned above, training technologies are clearly a component of the instructional intervention part of the human performance improvement toolkit. Training is essential in imparting key knowledge, skills and abilities to an organization's personnel. The papers in this advanced training technologies symposium will describe a tremendous capability for instructing NATO's military personnel. However, in this paper I have described the need for a larger strategic view of Human Performance improvement, of which training is a key part.

References

Addison, R. M. "Performance Technology Landscape" Performance Improvement. Vol. 42, Number 2 pp. 13-15, 2003

Brethower, D. The Human Performance Technology Value Proposition. Performance Improvement, Vol 42, Number 2, Feb. 2003

Moore, C. Learning management maturity model: Five stages of learning maturity within the enterprise. 2002. Chris.Moore@THINQ.com

O'Driscoll, T. Improving knowledge worker performance. Performance Improvement, Vol. 42, Number 4. 2003

Rosenberg, M.J. (1996) Human performance technology. In R. Craig (Ed.), The ASTD training and development handbook (pp. 370-393). New York: McGraw Hill

Rosenberg, M.J. (2001) E-Learning: Strategies for delivering knowledge in the digital age. McGraw Hill: New York.

Rosenberg, M.J. (2003) Building management solutions. Presented at the Training Director's Forum, Phoenix, Arizona, June, 2003

Stolovich, H.D. and Keeps, E.J. (Eds.) Handbook of Human Performance Technology – 2nd Edition. Jossey-Bass: San Francisco, 1999.